References to the algae in the Chinese classics

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(WITH ONE TEXT FIGURE)

The following notes on the algae referred to in ancient Chinese literature are at best sketchy, but are offered nevertheless for what they are worth. The references to the texts and the translations thereof are quoted on the authority of Mr. Y. T. Chu, Instructor of Biology at St. John's University, Shanghai, China, and Mr. C. F. Wu, formerly of St. John's, now of Cornell. The writer presents this paper with a view to throwing some new light on the development of science in general, and to introducing to the West, besides, some evidences of Far Eastern activity in this line, which parallels, if not predates, that of Europe.

Agriculture in China dates back to Shen Nung,* an emperor of the legendary period, 3000 B. C. He was said to be the first farmer and taught the people to till their fields. Since this mythical age, the people of China have been farmers primarily. As the Old Testament was essentially the expression of an agricultural and pastoral people and is, in consequence, replete with similes and references to plants and animals, so in the Chinese classics we find the farming life of the people, a life of continuous touch with nature, coming to expression in the frequently recurring allusions to animals and plants, and in the use of terms connected therewith. Long before the Aristotelian age of hearsay and philosophical conjecture, the ordinary facts of farming and floriculture had entered the realms of Chinese literature in the form of terms serving as figurative expressions for desirable characters and virtues. In order to have given time for everyone to become so familiar with these original terms that they crept unconsciously into speech and literature as specific classifiers, observation of the form and structure of plants must already have proceeded far. This is offered as one evidence of age-old familiarity with the facts of nature. The second is coincident with the first and deals with the ideographs representing these terms and ideas. The discovery and use of the facts of nature called into being special ideographs to

*Appendix, "Peking," by Juliet Bredon.

represent them, so that owing to the character of the language and its slow evolution, we feel that the appearance of these specific terms in the ancient literature places the knowledge back of them at a very early date.

We shall confine ourselves to the algae in this paper. The Chinese character, as we are accustomed to term the ideograph, is built up of many radicals or elementary symbols supposed formerly to have been pictures which taken together represent an idea. The character for algae is Tsao (FIG. 1) and may be resolved into four radicals, the ones for grass, water, wood, and mouth, the latter being repeated three times. The mouth radical is a simple rectangle, which when repeated three times and placed in the form of a pyramid, two at the bottom and one on top, make up an ideograph which means rank or character. This latter smaller ideograph seems to carry with its meaning the idea of segmented, or possibly cellular (!) structure because of the shape of the thrice repeated box-shaped radicals. Evidently the idea in their minds from the character used was that of a grass-like, fibrous or stringy, cellular plant that grows in the water. Such an analysis leads us to believe that they had in general a good idea of what an alga is.

FIG. 1. TSAO

a, grass radical; *b*, mouth radical; *c*, wood radical; *e*, water radical; *f*, small ideograph meaning rank or segment.

The character for Tsao first appeared in one of the five classics, the Canon of Boems (FIG. 1). In the chapter Chao Nan there appears the following passage, the romanized version of which is here given: "'yü bih bien tsao" (with respect to the collecting of algae). This term is still used today. The term for water plants is a much simpler character and therefore is much more general in its meaning. It has the grass and water radicals but no specifically descriptive ones. There can be no confusion then in the use of these terms.

In support of the cellular or segmented idea of algae brought out in the analysis of the character, K'ung An-kuo, in the Canon of History, says that "an alga is an aquatic plant that has systematically arranged branching parts, and is used, therefore, (figuratively) to denote literature." He may here be referring

to the diagrammatic structure of *Hydrodictyon*. Nearly two thousand years ago in a pond beside the temple of Han Voo Tee, algae were said to have grown to a length of nine feet. Among other characteristics they were reported as having the appearance of a net from which certain water birds were said to have had great difficulty in extricating themselves. The people called this the water-net alga. The structure of such types was plainly visible under careful scrutiny, hence a netted or reticulate structure was specifically attributed to algae.

About 600 B. C., in a book entitled Sze tsen, occurs the following reference to algae: "Some algae are a delicacy fit for the most honorable guest, even for the king himself." At the present time country people gather *Nostoc* for food. This is called "Heaven vegetable." Red algae are dried and eaten by farmers who live near the sea. It is to some of these doubtless that the quotation refers.

The real knowledge in Chinese medicine as it exists today is based on the Chinese "Materia Medica," the edition of which was begun four thousand years ago. The present edition was written two hundred years ago in the Ming dynasty. Among other plants, Kw'un Boo, or *Laminaria* is mentioned as being useful for medicinal purposes, for which it is calcined after being washed and sun-dried. It is a common practice in China to pack open cuts with ashes in order to stop the bleeding. Whether there is any discrimination shown as to what kinds of ashes are used the writer is not prepared to say. If there is, it is interesting to note that in case preference was shown for ashes of kelps, they must have realized that some medicinal virtue was contained in them. Iodine as an element was probably not known to the Chinese but they may have realized its presence as a virtuous remedy in other things.

As in western countries the sea weeds of the China coast are used by the farmers nearby for fertilizer and also, when dried for fuel. Agar-agar is made by the Chinese out of certain species of sea-weeds, a well known fact to most scientists and technicians.

The morphological characters of these marine forms seem to have been as well known as the freshwater forms, if not better. Many were said to be attached to stones. The large leafed forms were known as ox or horse algae. Some float on the top of the water, others live at the bottom. Of the smaller forms,

many have long silk-like filaments, the longer ones more than thirty "segments" each, and others have the appearance of "uncombed hair."

Metaphorically the term for algae is used in a very complimentary sense. The elegance and beauty of essays was often designated by or compared to that of the algae. The term was used in praise of the thinking of a learned man, signifying that his thoughts were as systematically ordered as the parts of an alga. Judgment was in like manner complimented. The algae contributed not only to the language and literature of the Chinese but also to their art and superstitions. In an old book called Zong Shu, we find reference to conventionalized designs derived from algae being included in the embroidery of their garments. When the figures of algae appeared on the ends of the roof beams of their houses in brilliant colors, we find that the underlying idea was protection from fire. Because algae were known to be water plants, any evidence of them on houses was a protection against fire in that the former invoked the aid of their native element to drive away the fire spirit.

From this discussion we begin to realize that from direct references in ancient Chinese literature and an analysis of the ideograph, there is a possibility, if not a probability, that the knowledge of the algae as a distinct morphologic unit in the plant kingdom dates back to very early times, as compared with the state of knowledge in western countries. Moreover this knowledge seemed to be more wide spread amongst the people from the use of Tsao in a metaphorical sense, in its practical use as medicine, as food and fuel, and as fertilizer; as the basis of commercial products; and in the realization of its decorative value and its superstitious meaning.